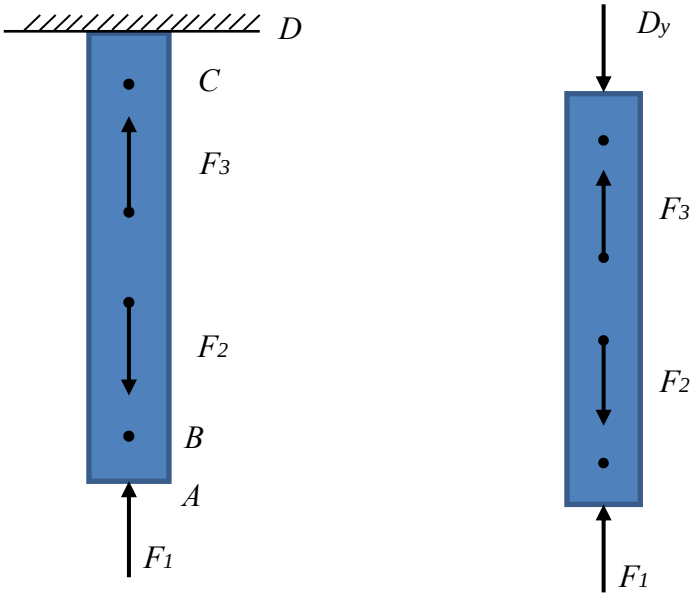
10. The bar is loaded with F_1, F_2, F_3 , which are independently and normally distributed with $F_1 \sim N(18,1^2)$ kN, $F_2 \sim N(30,3^2)$ kN, and $F_3 \sim N(55,6^2)$ kN , respectively. Determine the distribution of the internal normal force at points *B* and *C*.



Solution

Since $F_1 \sim N(18,1^2)$ kN, $F_2 \sim N(30,3^2)$ kN, and $F_3 \sim N(55,6^2)$ kN , we have

$$\sum F_y = 0;\ F_1 + F_3 - F_2 - D_y = 0$$

$$\mu_{D_y} = \mu_{F_1} + \mu_{F_3} - \mu_{F_2} = 43 \text{ kN}$$

$$\sigma_{D_y} = \sqrt{\sigma_{F_2}^2 + \sigma_{F_1}^2 + \sigma_{F_3}^2} = 6.78 \text{ kN}$$

$$D_y \sim N(43, 6.78^2) \text{ kN}$$

For segment *AB*

$$\sum F_y = 0;\ F_1 - N_B = 0,\ N_B = F_1$$

$$N_B \sim N(18, 1^2)\ \text{kN} \qquad \textbf{Ans.}$$

For segment *DC*

$$\sum F_y = 0;\ D_y - N_C = 0,\ N_C = D_y$$

$$N_C \sim N(43, 6.78^2)\ \text{kN} \qquad \textbf{Ans.}$$